How did basketball teams win EuroBasket 2015? A non-standard analysis of performance based on passes, dribbling and turnovers

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Abstract: The aim of the study was to determine the full structure of passes during EuroBasket 2015 in the context of the execution technique, creating a passing lane, the movement of the players, the ball passing direction and passing distance. In order to provide extended data, the study also analysed individual dribbling sequences, changes of dribbling direction and turnovers. The analysis encompassed 27,840 passes, 84,080 dribbles and 1467 turnovers in all matches (n = 110) played by the eight best and the eight worst teams. Furthermore, 2030 assists were analysed to develop the model of regression. One-handed passes performed with the right hand (F = 28.74; p = 0.0028) were the most important predictor for the assists executed by the players of the eight best teams. Conversely, the most important predictor for the assists executed by the players from the weakest teams were two-handed overhead passes (F = 21.34; p = 0.0001). Today, coaches must incorporate two elements of passing technique into their training regime: primarily, one-handed passes (in particular, one-handed basic passes); and secondly, two-handed passes (overhead and chest passes). Solutions should be sought with the aim of increasing the number of inside passes, which will develop the inside play.

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A nonstandard analysis of performance based on passes, dribbling and turnovers

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ABSTRACT

The aim of the study was to determine the full structure of passes during EuroBasket 2015 in the context of the execution technique, creating a passing lane, the movement of the players, the ball passing direction and passing distance. In order to provide extended data, the study also analyzed individual dribbling sequences, changes of dribbling direction and turnovers. The analysis encompassed 27,840 passes, 84,080 dribbles and 1467 turnovers in all matches (n=110) played by the eight best teams (placed 1–8; n=70) and the eight worst teams (placed 17–24; n=40) taking part in the event. The study used a categorized observation. Furthermore, 2030 assists were analyzed to develop the model of regression. A multiple stepwise regression analysis showed that one-handed passes performed with the right hand (F=28.74; p=0.0028) were the most important predictor for the assists executed by the players of the eight best teams at EuroBasket 2015. Conversely, the most important predictor for the assists executed by the players from the weakest teams were two-handed overhead passes (F=21.34; p=0.0001). Today, coaches must incorporate two elements of passing technique into their training regime: primarily, one-handed passes (in particular, one-handed basic passes); and secondly, two-handed passes (overhead and chest passes). Solutions should be sought with the aim of increasing the number of inside passes, which will develop the inside play.

Keywords: game analysis; technique analysis; performance indicators; types of passes; dribbling; turnovers

INTRODUCTION

Passes, apart from shots and dribbling, are one of the most important elements in the structure of the technical actions used during offensive play in basketball. In fact, players often perform accurate shots after passes executed with the correct technique and speed, and the points scored in this way determine the team's victory or defeat (S. Ibáñez et al., 2008). Around 60–75% of successful field goals come from passes/assists (M. Á. Gómez, Lorenzo, Sampaio, Ibáñez, & Ortega, 2008; Miller, 1994; Oudejans, Karamat, & Stolk, 2012).

Passing is also the fastest way to transfer the ball from the defense to offence (Tsamourtzis, Karypidis, & Athanasiou, 2005), and is a significant element in transition offence as it allows players to quickly carry out a fast break (Cárdenas et al., 2015; Conte, Favero, Niederhausen, Capranica, & Tessitore, 2017; Krause, Meyer, & Meyer, 2008), as well as allowing for a quicker execution of the planned moves in half-court offence (Theoharopoulos, Lapardis, Galazoulas, & Tsitskaris, 2010). Some coaches consider passing to be the most important technical element of offence due to its low margin of error, or even the lack thereof; if a player crosses this margin, the pass ends in an immediate turnover (Wissel, 2004; Wootten & Gilbert, 2013). Conversely, for shots, it is assumed that a player should display an accuracy of at least 50% (Chang, 2018; Theoharopoulos et al., 2010).

A correct dribbling technique makes changing the direction of the dribbling more effective (Andrić, 2011; Trninić, Karalejić, Jakovljević, & Jelaska, 2010), which helps to gain an advantage in one-on-one clashes during offensive actions (Arias-Estero, 2013; Arias-Estero, Argudo, & Alonso, 2018). It also increases the accuracy of passes, especially those performed while moving with the ball (Arias, Argudo, & Alonso, 2012).

Lastly, a correct technique of passes and dribbling reduces the number of turnovers (Conte, Favero, Niederhausen, Capranica, & Tessitore, 2016). An increasing number of errors increases the odds of defeat (S. J. Ibáñez, Sampaio, Sáenz-López, Giménez, & Janeira, 2003). On the other hand, an improved technique of passes and dribbling reduces the number of errors, which leads to assists and the scoring of points (Angel, Tsamourtzis, & Lorenzo, 2006; Csataljay, O'Donoghue, Hughes, & Dancs, 2009; S. Ibáñez et al., 2008).

Recently, we have seen an increase in the number of scientific studies on the indicators of the effectiveness of play in basketball that are based mostly on observations, which may provide us with information to use in streamlining play and training (O'Donoghue, 2009). However, the vast majority of these scientific reports concern the cooperation between players, both in offensive (*i.e.,* tactical determinants and small-sided games) (Arias-Estero et al., 2018; Bredt et al., 2018; Conte et al., 2017; Gryko, Słupczyński, & Kopiczko, 2016; McCormick et al., 2012) and defensive (*i.e.,* defensive pressure on basketball shooting performance) (Csataljay, James, Hughes, & Dancs, 2013; Sampaio et al., 2016), and to a minor degree, the technical structure of the players' actions. The most recent scientific studies analysing the shooting structure during a match take into account all the currently used types of shots (*e.g.* one-handed overhead shots, layups, reverse shots, hook shots and floaters), as well as the execution technique (*e.g.* footwork, including: while stationary, during jump shots and with catch-and-shoots after a two-count stop) (Erčulj & Štrumbelj, 2015; Gryko, Mikołajec, Maszczyk, Cao, & Adamczyk, 2018). However, there is a lack of such detailed studies on the structure of the other key groups of actions involved in offensive play; in particular, in relation to passes.

The passing behaviour has only been described as assists in the traditional box score. However, the numbers written down in the statistics reflect the final results of actions and ignore the preceding factors. They may also omit detailed information, especially in the context of the technical execution of the players' actions or cooperation between specific formations of players. This is why the research in this area needs to continue.

The few publications concerning passes classify the passes only according to their execution technique: the highest share belonged to chest passes and overhead passes (38.9% and 24.9%, respectively) (Theoharopoulos et al., 2010). It was mentioned that the chest pass is the most basic pass, followed by the bounce pass, overhead pass, baseball pass and hand-off pass in terms of the percentages of use during a game (Theoharopoulos et al., 2010). Another study analyzed the inside pass in detail and concluded that including an inside pass during set offense and intensifying actions focused on the inside game could increase the effectiveness of the offensive actions (Courel-Ibáñez, McRobert, Toro, & Vélez, 2016). On the other hand, the winning teams make more passes (M.A. Gómez, Tsamourtzis, & Alberto, 2006). A publication on dribbling states that crossover dribbles and dribbles between the legs constitute the highest share of changes in the dribble direction (61% and 23%, respectively) during EuroBasket 2009 (Andrić, 2011).

A review of the literature indicates a lack of studies containing significant information on the structure of passes and dribbling during a game. The publications lack information about passes in the context of creating a passing lane (*i.e.,* whether the passes were executed with the creation of a new passing lane or not), the movement of the players (*i.e.,* whether the passes were performed while stationary, while running, off the dribble or through a jump pass) or the movement of the ball (*i.e.,* flat, lob, bounce and hand-off passes), passing

direction (*i.e.,* perimeter, inside and outside passes) and passing distance (*i.e.,* short, long and skip passes). There is also a lack of information about the distribution of dribbles in individual dribbling sequences.

Analyzing the full structure of passes and dribbling and the causes of turnovers among top-class players during the most prestigious sporting events, in the context of the technical execution of these passes, has become the key factor in coaching and directly affects the effectiveness of individual players and teams. Due to the limited time in which the various techniques of passes or handling the ball can be taught during training sessions, coaches should focus on teaching the most frequently used techniques. Lastly, learning the structure of the technical actions in basketball is of fundamental importance for the practice of training, because it determines the rational choice of the training concept in order to achieve particular sports aims.

For the reasons presented above, we carried out the present study to determine the full structure of the passes occurring during EuroBasket 2015 in the context of handwork, creating a passing lane, the movement of the players and the movement of the ball, passing direction and passing distance. In order to provide extended data, the study also analyzed individual dribbling sequences, changes dribbling direction and turnovers.

MATERIALS AND METHODS

Sample

To achieve the aim of the study, 110 matches of EuroBasket 2015 were observed, for a total of 27,840 passes, 84,080 dribbles and 1467 turnovers. In the study, the structure of the passes,

the players' movement on the court with the ball and turnovers were investigated among the best teams that ranked 1–8 in the final classification of EuroBasket 2015, as well as among those who were eliminated immediately after the group stage and were ranked 17 to 24. The analysis encompassed 27,840 passes, 84,080 dribbles and 1467 turnovers in all matches (n=110) played by the teams placed 1–8 (n=70) and those eliminated the quickest (n=40). Additionally, 2030 assists were analyzed to create the model of regression.

Variables

The categorized observation method was applied in the study, which meant that each of the games registered on DVD format was analyzed in detail in terms of the structure of the passes, dribbling and turnovers. The observations were conducted by two experts with at least 12 years of experience in coaching, including working with national teams. Recordings of all games were obtained due to access to the official FIBA server (https://gamevideos.fiba.com/login). To reliably assess the structure of the passes, dribbling and turnovers experts have used Corel VideoStudio Pro software (X5, 2012 Corel Corporation, Canada. According to the final places, the following teams were observed: Spain, Lithuania, France, Serbia, Czech Republic, Latvia - 9 games, Greece, Italy - 8 games (eight highest-ranking teams) and Russia, Germany, Northern Macedonia, Estonia, Netherland, Ukraine, Bosnia and Herzegovina, Iceland - 5 games (eliminated teams after round-robin).

Inter-rater reliability agreement, for all observations were assessed by using Cronbach's α statistic (Cronbach, 1951). This coefficient presents values between 0 and 1 and shows the reliability of internal consistency. A value of 1 is perfect reliability but >0.70 is considered

189 valid (Koo, & Li, 2016, Taber, 2018). A Cronbach's statistic of over 0.82 was obtained for
190 all the datasets (Table 1), attesting to the reliability of the data subsequently analyzed.
191
192 First, the study investigated the structure of the passes and catches according to the following:
193 • passing lane:
194 – creating a passing lane: positioning oneself relative to the player with the
195 ball to enable an accurate and direct pass with a minimal risk of ball loss
196 (while evading a defending player positioned between the player with the
197 ball and the player's partner that is to receive the ball);
198 – without creating a passing lane;
199 • handwork:
200 – passing hand: right, left, both hands;
201 – technical execution of a pass: two-handed chest pass, two-handed overhead
202 pass, one-handed basic pass, baseball pass, hook pass, behind-the-back
203 pass, situation-related pass;
204 • flight path of the ball: flat, lob, bounce pass, hand-off pass;
205 • the player's movement during a pass: while stationary, while running, off the
206 dribble, through a jump pass;
207 • passing direction: perimeter, inside, outside;
208 • passing distance: short (passing over to the two nearest court positions), long pass
209 (passing the ball over a distance greater than the distance to the two nearest court
210 positions), skip pass (a long pass to the player on the opposite side of the court);
211 • catch after receiving the ball: one-handed, two-handed.
212 Next, in accordance with the objectives of the study, we registered and classified the
213 players' movements with the ball according to:

- number of dribbles in an individual sequence: one dribble, two dribbles, three dribbles, four dribbles, five dribbles or more;
- handwork: right hand, left hand, with the change of hands;
- manner of changing direction: cross-over, under the leg, behind the back, using a reverse dribble.

Turnovers were registered according to the number of ball losses, traveling, bad passes, offensive fouls, blocks received and time violations (committed by the player and the team).

Statistical analysis

The analysis of the numerical data describing the specificity of the passes, dribbling and turnovers during EuroBasket 2015 used the following statistical measures: arithmetic mean ($\bar{X}$), standard deviations (SD), percentage share in a set (%), and the confidence interval(95%).The assumption of the normality of distribution of the studied variables was tested with the Shapiro-Wilk test and the assumption of the equality of variance was tested with Levene's test. The t-test for independent variables (two groups) was applied to determine the significance of the differences in the values describing the structure of the passes, the players' movements with the ball and the turnovers between the best teams and the teams eliminated after the end of the group stage in EuroBasket 2015. The significance of the differences of the variables, for which the assumptions of the parametric analyses were not fulfilled, was evaluated with the Mann-Whitney U-test. As the measure of the effect size, the study used the Hedges'g: small effect <0.2; medium effect 0.2–0.5; large effect >0.5 (Ellis, 2010). In order to find a correlation between the assists and the technique of the passes executed by the players from the observed team, we applied the model of multiple forward

stepwise regression. In all the analyses, the significance of the effects was assumed at $p<0.05$. All calculations were performed with STATISTICA software (v.12, StatSoft, USA).

RESULTS

The characteristics of the passes performed by the players from the eight best and worst teams in EuroBasket 2015, including catches after receiving the ball, are presented in Table 2.

The analysis of the values in the context of the diversification of the structure of the passes allows for the conclusion that the teams who advanced to the quarterfinals in EuroBasket 2015 executed a statistically significantly higher (by 39.7%, Z=4.27, p=0.001, g=0.89) number of one-handed passes performed with the right hand than the teams who left the championship competition after the group stage. The opposite trend was observed for two-handed passes, in which the players from the best teams executed a significantly lower number of these (by 19.5%, Z=-3.64, p=0.001, g=0.72) in comparison to the basketball players from the eight weakest teams. The highest share among all the researched teams belonged to two-handed passes (around 53–66%) and one-handed passes performed with the right hand (around 26–38%).

The analysis of the structure of the passes executed by both groups, in the context of the technical manner of completing a pass, revealed a significant dominance of one-handed basic passes (by 38.5%, Z=3.29, p=0.001, g=0.72) and a lower number of two-handed chest passes (by 27.8%, Z=-4.57, p=0.001, g=1.13) in the group of the best teams. In this group, one-handed basic passes constituted the greatest share, followed by two-handed chest passes (over 42% and almost 35%, respectively). An opposite trend was observed in the eight weakest

263 teams, where two-handed chest passes (over 48%) constituted the greatest share, followed by
264 one-handed basic passes (over 30%).As far as the flight path of the ball was concerned, the
265 players from the best teams performed lob passes more frequently (by 45.8%, Z=4.14,
266 p=0.001, g=0.54), but the greatest share in both groups belonged to flat passes (around 72–
267 74%).
268
269 The analysis of the players' movements during the execution of the passes revealed that, in
270 comparison to the teams from the second group, the eight best teams performed a higher
271 number of running passes (by 58.2%, Z=3.83, p=0.001, g=0.52) and jump passes (by 36.1%,
272 Z=2.95, p=0.003, g=0.55),and a lower number of passes off the dribble (by 26.1%, Z=-2.69,
273 p=0.001, g=0.65). However, the greatest share of all the passes (around 63–66%) belonged to
274 passes executed while stationary.
275
276 In terms of the direction of the passes executed by the players from the best teams, in the
277 study a higher number of inside passes was observed (by 62.1%, Z=5.38, p=0.001, g=1.09).
278 On the other hand, a lower number was observed for perimeter passes (by 19.6%, Z=-3.64,
279 p=0.001, g=0.86), which had the greatest share among all the passes in both groups (59.5%
280 and 73.7%, respectively). A further analysis of the results in the context of the distance of the
281 executed passes allows us to observe that, the highest share by far among all teams belonged
282 to short passes, that is, to passes performed over the distance of a single pass (89–93%). The
283 rest of the classifications concerning the structure of the passes did not reveal any significant
284 differences.
285
286 The analysis of the structure of the players' movements with the ball (Table 3) in terms of the
287 diversification of the number of dribbles in individual sequences among the best teams

showed a significantly lower number of single-dribble sequences (by 18.4%, t=-3.27, p<0.01, g=0.65) and four-dribble sequences (by 13.9%, t=-2.41, p<0.05, g=0.48). In the study, a significant dominance of sequences with five or more dribbles was observed (around 72–74%) from among all the dribbles performed during the matches.

The basketball players representing the eight best teams at EuroBasket 2015 more often changed the direction of their dribbling by bouncing the ball under the leg (by 24.9%, t=2.09, p<0.05, g=0.47) in comparison to the players from the eight weakest teams. In both groups, the players with the ball most frequently changed the direction of their dribbling by using a cross-over dribble, with a percentage share of around 72–78%.

The structure of offensive actions ending in a turnover executed by the players from both groups is presented in Table 4. It was observed that the total numbers of turnovers and bad passes were lower in the higher-ranking teams (by 12.4%, t=-2.43, p<0.05, g=0.51; and by 19.0%, t=-2.41, p<0.05, g=0.52, respectively).Bad passes constituted the highest share of all the turnovers (at about 40–44%).

Table 5 presents the results of the regression analysis and model values for each manner of passing in relation to assists performed by the best (F=62.07; p=0.001) and the weakest teams (F=55.85; p=0.001) at EuroBasket 2015.The remaining independent variables that formed an optimal vector have been excluded from the regression model due to being statistically insignificant.

311 The multiple forward stepwise regression analysis for the assists (A) dependent variable
312 established the function of a regression in the following form, based on the particular values
313 that were significant in the model of the independent variables:
314 A = 8.8601 + 0.0693*One-handed with the right hand+ 0.1101*Two-handed overhead (eight
315 highest-ranking teams)
316
317 A = 1.2097+ 0.1356*Two-handed overhead+ 0.1667* Long + 0.0445*Two-handed chest
318 (eliminated teams).
319
320 At the same time, the analysis showed that the most important predictor for the assists
321 performed by the players from the eight best teams at EuroBasket 2015 were one-handed
322 passes made with the right hand. On the other hand, the most important predictor for the
323 assists performed by the players from the weakest teams were two-handed overhead passes.
324

325 DISCUSSION

326
327 The key aim, which at the same time constituted the main research objective presented in the
328 Introduction section of this paper, was to determine the full structure of the passes performed
329 during EuroBasket 2015. To a large extent, the applied division criteria of the technique of
330 executing passes have not appeared in the studies conducted by other authors, but these are
331 nonetheless extremely significant from a practical viewpoint. Subsequently, the results of the
332 research concerning dribbling (including dribbling sequences, handwork and the changes of
333 dribbling directions) have been presented and the causes of the turnovers suffered by the
334 players analyzed.
335

336 It can be concluded that the numbers of one-handed basic passes and passes made with the
337 right hand were significantly higher in the teams that advanced into the top eight at
338 EuroBasket 2015 than in the rest of the teams, and this stems from the fact that the one-
339 handed basic pass is currently the primary pass used by the most well-trained players,
340 especially those under high pressure from the defense (Krause et al., 2008). The player with
341 the ball and his partner will attempt to create a passing lane, predominantly by using a one-
342 handed pass. This allows the player with the ball to pass the ball over to the partner
343 effectively, while evading the defensive player located between the two (Wissel, 2004).
344 Because the vast majority of players were right-handed, both groups are dominated by right-
345 handed passes.
346
347 Even though two-handed passes constituted the highest share in both of the compared groups,
348 the share of these passes among the best teams was lower by 12.7% than the share of one-
349 handed passes. The best players attempted to reduce the number of two-handed passes
350 (especially chest passes) in favor of one-handed passes, which was indicated by the
351 distribution of the passes according to the technical manner of passing. One-handed basic
352 passes dominated among the best teams, and two-handed chest passes dominated among the
353 weakest teams. Due to an increased pace of the game and improved defense, the players often
354 performed a one-handed basic pass without catching the ball, immediately off the dribble,
355 which considerably shortened the time between a player's decision to make a pass and the
356 player's partner receiving the ball (Courel-Ibáñez et al., 2016, Maimón, Courel-Ibáñez &
357 Ruíz, 2020). When the player with the ball is under pressure and the others without the ball
358 are also aggressively defended two aspects are extremely relevant – timing and passing line. It
359 terms of that one-handed basic pass must be applied in order to deliver the ball to the open
360 player at appropriate time. A precise and quick pass in correct timing is needed in order to

361 transfer the ball effectively (Wissel, 2004). Different results were obtained in a study
362 conducted by Theoharopoulos *et al.* (Theoharopoulos et al., 2010), who indicated that two-
363 handed chest and overhead passes play the dominant role (38.9% and 24.9%, respectively).
364 However, their study was conducted on matches of a significantly lower level.
365
366 Lobs, including alley-oop passes, were executed more frequently by the best teams, but
367 overall, flat passes dominated. A lob is difficult to execute and requires a high synchronicity
368 of actions between the player passing the ball and the partner (Courel-Ibáñez et al., 2016).
369 This is why this type of pass is used to a greater extent by advanced teams, who use more
370 refined tactics than less experienced teams. Such tactics usually involves plays such as the
371 pick and roll, backdoor cut, back picks, inside-outside, etc. (Courel, Suárez, Ortega, Piñar, &
372 Cárdenas, 2013; Gómez et al., 2015). That is why lobs are used to a large extent in such types
373 of actions involving two or three players.
374
375 The fact that the best teams performed more running passes and jump passes than passes off
376 the dribble indicates that the game enforced a higher pace throughout the tournament and a
377 tendency to avoid dribbling if possible, which increased the speed of the ball and forced the
378 players who did not have the ball to be highly active (Zhang, Lorenzo, Woods, Leicht &
379 Gómez, 2019). A fairly interesting finding in the study was that overall, passes while
380 stationary were the dominant ones. This result is fairly surprising, considering the earlier
381 findings. We may, however, find a confirmation of this result in a study by Andrić (Andrić,
382 2011), who concluded that in the European Championship in Poland in 2009, the players
383 ended dribbling with a stop and a pass while stationary.
384

In the case of the direction of the passes executed by the players of the best teams, a higher number of inside passes (by more than 62%) were observed during the study. On the other hand, lower numbers were noted in relation to perimeter passes, which constituted the highest share of all passes in both groups. A further analysis of the research results in the context of the distance of the performed passes allowed us to observe that short passes had the highest share of all passes in all teams. These results indicate the dominance of the half-court offence that predominantly involved short passes. This concerns almost all the actions involving screens and offensive solutions, such as a drive and kick play followed by an extra pass. A higher number of inside passes among the best teams indicates that they used the inside play more often, while trying to transfer the ball to the center player close to the restricted area. Therefore, the conclusion of the study by Courel-Ibáñez *et al.* (Courel-Ibáñez et al., 2016) stating that increasing the number of actions focused on the inside game increases the effectiveness of offensive actions has been confirmed.

The analysis of the structure of the players' movements with the ball on the court showed a definite dominance of the sequence with five dribbles or more, taking into consideration all the data concerning this criterion. Dribbling is used in many situations: for transferring the ball from the backcourt to the frontcourt, for evading a defending player, for creating a passing lane and for avoiding a 'trap'. Usually, the players aim to reduce the number of dribbles in order to increase the speed and effectiveness of the game, which is why our result indicating the dominance of the sequences with five dribbles or more was surprising.

The basketball players representing the eight best teams at EuroBasket 2015 changed the direction of their dribbling under the leg more often in comparison to the players from the eight weakest teams. The players in both groups most frequently changed the direction of

410 their dribbling by using a cross-over dribble, with the share of this technique amounting to
411 about 72–78% of the changes. This is an important point for basketball practice, as changes
412 behind the back and through a reverse dribble are executed much less frequently than the
413 cross-over dribble and by bouncing the ball under the leg. The latter is used especially in a
414 situation where the change cannot be made through a cross-over dribble, due to the defender
415 standing at a close distance. The dominant position of the change through a cross-over dribble
416 stems from the fact that this technique is the easiest, the quickest and allows for a correct
417 observation of the frontcourt. Similar results were obtained by Andrić (Andrić, 2011), who
418 investigated the frequency and effectiveness of various types of dribbling during the Senior
419 European Championship in 2009 in Poland. The abovementioned study indicates that the
420 dominant variant in changing the direction of the dribbling was the change performed in
421 through a cross-over dribble (61% of changes of the dribbling direction). The same study
422 indicated that the change under the leg was the second most frequently used technique for
423 changing the direction of the dribbling (23%).
424
425 The analysis of the structure of the offensive actions that ended in a turnover revealed a lower
426 number of total turnovers and bad passes among the higher-ranking teams (by 12.4% and
427 19.0%, respectively). However, the highest share of turnovers was caused by bad passes
428 (around 40–44%). A pass, as opposed to dribbling which is an individual action, is a two-
429 player action requiring cooperation between the player making the pass and the receiving
430 partner (Sampaio et al., 2015). The likelihood of an error is considerably higher in the case of
431 the latter, which in turn makes a bad pass the dominant cause of turnovers. The lower number
432 of turnovers among the best teams at the European Championship indicates the better training
433 of the individual players in these teams, resulting in more optimal use of the basic forms of
434 two-player and three-player cooperation, better organized team play and decisiveness in

particular situations during a game. The obtained results were consistent with those obtained by Fylaktakidou *et al.* (Fylaktakidou, Tsamourtzis, & Zaggelidis, 2011). These authors analyzed 43 games in the women's A1 national league and concluded that at this level, the main causes were bad passes (40.2%), travelling (23.6%) and handling the ball (23.9%).

The analysis of regression for each passing technique in relation to assists executed by the best and the worst teams at EuroBasket 2015 indicated that, for the players from the top-eight teams at EuroBasket 2015, the most important predictor for the assist variable was one-handed passes performed with the right hand. Conversely, the most important predictor for the assists performed by the players from the weakest teams was two-handed overhead passes. An assist is a pass that precedes the successful finish of an offensive action (Miller, 1994). Determining a prognostic factor for this variable has a significant practical dimension and indicates the necessity for the continuous improvement of passing skills, especially the skill required to execute one-handed passes. The fact that the study results indicated that the players used their stronger hand also suggests that the teams organized their offensive tactics such that the individual players would perform the majority of the actions with their stronger hand and to the stronger side.

Limitations

The potential scientific criticisms regarding the results of this study are related to the fact that, in order to provide a full explanation of the observed trends, other variables justifying the researched phenomenon should also be taken into consideration. The present study does not discuss the effects of a defending player and the pressures exerted on a player with the ball who is performing a pass. We have been evaluating the same teams in several games, however they competed with different opponents. The quality of teams they played

against changed and the achieved data might be affected by this factor. Besides the results can be dependent on the level of players taking part in the competition. Usually better skilled athletes are able to perform much better compared to those less advanced. It also has impact on the value of analyzed structural game variables for example passing outcome. The collected data were coming from European Championship. All games during this kind of FIBA competition are organized under standardized conditions. Therefore, it is hard to say that the distance of passing may be influenced by game location. It seems to be interesting goal for next research to discover the passing quality in terms of that factor. It would also be worthwhile to obtain information about which types of passes were performed depending on the offensive systems (fast break offences and half-court offences). Another issue worth taking into account is an analysis of the passes according to the zone where the pass was made and received. Lastly, an analysis of the causes of the turnovers (the greatest share of which belonged to bad passes) would lead to the question regarding the technical manner of passing in the case of bad passes. However, this would require new classifications with division criteria to be designed, which may be a starting point for another study. Furthermore, more precise data is required in the context of the decisions made by the players in the moment of a pass, which would contribute to a more detailed analysis. This also refers to information about the tactical solutions used in the offensive play among the observed teams, since a specific plan of play may determine the execution of an action. However, this would require cooperating with the coaches, who would have to provide us with the detailed offensive 'playbook' of their teams.

CONCLUSIONS

To sum up the results of the study in the context of the practical recommendations, it should be emphasized that coaches must currently incorporate two elements of passing technique into their training regime: primarily, one-handed passes (in particular, one-handed basic passes); and secondly, two-handed passes (overhead and chest passes). We should look for solutions intended to increase the number of inside passes, creating inside plays and cooperation between short and tall players. In particular, the training should pay special attention to short passes. As far as the manner of changing the direction of the dribbling is concerned, a focus should be placed on changing the direction of the dribbling through a cross-over dribble and by bouncing the ball under the leg. Coaches, first and foremost, should devote more time to developing perfect passes, at the cost of dribbling, which can be concluded from the fact that the main cause of turnovers is connected with passes and not with dribbling.

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626 **TABLE 1** Cronbach's α statistic and percentage of inter-observer agreement for each dataset

Variables	Eight highest-ranking teams		Eliminated teams	
	α	% Agreement	α	% Agreement
With the creation of a passing lane	0,9252	93%	0,8248	82%
Without creating a passing lane	0,8457	85%	0,8492	85%
One-handed pass with the right hand	0,8407	84%	0,9649	96%
One-handed pass with the left hand	0,9785	98%	0,8382	84%
Two-handed pass	0,8542	85%	0,8955	90%
Two-handed chest pass	0,8707	87%	0,8552	86%
One-handed overhead pass	0,9560	96%	0,9036	90%
One-handed basic pass	0,8617	86%	0,9046	90%
Baseball pass	0,8282	83%	0,8241	82%
Hook pass	0,8141	81%	0,9055	91%
Behind-the-back pass	0,8559	86%	0,8767	88%
Situation-related pass	0,9759	98%	0,9633	96%
Flat	0,9770	98%	0,8366	84%
Lob	0,8749	87%	0,8557	86%
Bounce pass	0,8463	85%	0,8725	87%
Hand-off pass	0,9439	94%	0,8889	89%
While stationary	0,9173	92%	0,8435	84%
While running	0,8931	89%	0,8894	89%
Off the dribble	0,8861	89%	0,9380	94%
Jump pass	0,8895	89%	0,9842	98%
Perimeter	0,8632	86%	0,9162	92%
Inside	0,9544	95%	0,9400	94%
Outside	0,8464	85%	0,8784	88%
Short pass	0,8390	84%	0,9795	98%
Long	0,8868	89%	0,8488	85%
Skip pass	0,8201	82%	0,9161	92%
One-handed	0,9723	97%	0,9264	93%
Two-handed	0,9877	99%	0,8378	84%
1 dribble	0,9198	92%	0,9713	97%
2 dribbles	0,9534	95%	0,9078	91%
3 dribbles	0,8295	83%	0,8330	83%
4 dribbles	0,8713	87%	0,8699	87%
5 or more dribbles	0,9149	91%	0,9742	97%
Right hand	0,9212	92%	0,8617	86%
Left hand	0,9492	95%	0,8372	84%
With the change of hands	0,8862	89%	0,9647	96%
Cross-over dribble	0,9810	98%	0,9242	92%
Under the leg	0,8565	86%	0,8315	83%
Behind the back	0,8248	82%	0,9171	92%
Reverse dribble	0,8343	83%	0,9535	95%
Total turnovers	0,9368	94%	0,9261	93%
Loss of the ball	0,9463	95%	0,9334	93%
Travelling	0,9886	99%	0,9556	96%
Bad pass	0,9764	98%	0,8326	83%
Offensive foul	0,9892	99%	0,9021	90%
Received block	0,8915	89%	0,9873	99%
Time violation by the player	0,9242	92%	0,8697	87%
Time violation by the team	0,9904	99%	0,9710	97%

TABLE 2 Diversification of the structure of the passes and catches in the studied teams during FIBA EuroBasket 2015

Type of pass			Eight highest-ranking teams (n=70)			Eliminated teams (n=40)			Test value (p-value)	Effect size Hedges'g
			$\bar{X}$ ± SD	% of the total	95% confidence interval	$\bar{X}$ ± SD	% of the total	95% confidence interval		
Total passes			252.9 ±30.7	100	245.4–260.4	253.8 ±30.9	100	243.7–263.8	-0.1432 (0.8864)	0.0292
According to the passing lane	**With the creation of a passing lane**		55.6 ±37.3	22.0	46.5–64.7	68.2 ±22.7	26.9	60.8–75.6	-1.9107 (0.0588)	0.3843
	Without creating a passing lane		197.3 ±45.7	78.0	186.2–208.5	185.6 ±33.6	73.1	174.2–196.0	1.4566 (0.1482)	0.2803
According to the handwork	**According to the passing hand**	**One-handed pass with the right hand**	94.0 ±32.8	37.2	80.6–96.6	67.3 ±24.2***	26.5	58.9–74.6	4.2682 (0.0001)	0.8905
		One-handed pass with the left hand	24.8 ±13.8	9.8	21.5–28.2	19.9 ±12.1	7.8	15.9–23.9	1.8433 (0.0681)	0.3709
		Two-handed pass	134.1 ±47.8	53.0	122.4–145.7	166.6 ±40.4***	65.7	153.5–179.7	-3.6393 (0.0003)	0.7180
	Two-handed chest pass		88.3 ±30.8	34.9	86.7–101.7	122.4 ±28.6***	48.2	113.1–131.7	-4.5728 (0.0001)	1.1358
	One-handed overhead pass		45.8 ±13.2	18.1	42.5–49.0	44.2 ±14.6	17.4	39.5–48.9	0.5677 (0.5714)	0.1166
	One-handed basic pass		107.1 ±44.2	42.3	93.2–114.8	77.3 ±36.5***	30.5	65.5–89.2	3.2953 (0.0010)	0.7166
	Baseball pass		2.7 ±2.4	1.1	1.9–3.3	1.5 ±1.8	0.6	0.6–1.8	1.0482 (0.2969)	0.5449
	Hook pass		2.8 ±2.5	1.1	1.7–2.9	1.9 ±1.7	0.7	1.4–2.5	0.8968 (0.3719)	0.4010
	Behind-the-back pass		0.9 ±0.7	0.4	0.5–1.1	0.3 ±0.9	0.2	0.0–0.6	1.1384 (0.2576)	0.7710
	Situation-related pass		5.3 ±7.4	2.1	3.1–6.6	6.2 ±9.3	2.4	2.9–8.9	-0.7299 (0.4671)	0.1106

According to the flight path of the ball	**Flat**	183.4 ±27.2	72.5	176.8–190.1	187.1 ±27.7	73.7	178.1–196.1	-0.6673 (0.5060)	0.1351
	Lob	19.1 ±9.5	7.5	17.2–21.9	13.1 ±13.4***	5.2	9.0–17.7	4.1372 (0.0001)	0.5421
	Bounce pass	33.3 ±10.5	13.2	30.7–35.9	35.5 ±9.9	14.0	32.2–38.7	-1.0480 (0.2970)	0.2139
	Hand-off pass	17.1 ±7.4	6.8	15.3–18.9	18.1 ±4.6	7.1	16.8–19.8	-0.8898 (0.3756)	0.1532
According to the movement	**While stationary**	165.2 ±29.9	65.4	158.9–173.6	160.9 ±30.2	63.4	151.2–170.7	0.8157 (0.4147)	0.1433
	While running	26.1 ±17.2	10.3	21.9–30.3	16.5 ±20.6***	6.5	9.8–23.2	3.8292 (0.0001)	0.5190
	Off the dribble	50.3 ±27.7	19.9	44.1–57.6	68.1 ±27.1**	26.8	59.3–76.9	-2.6926 (0.0071)	0.6476
	Jump pass	11.3 ±5.4	4.4	10.0–12.6	8.3 ±5.4**	3.3	7.1–10.6	2.9481 (0.0032)	0.5556
According to the direction	**Perimeter**	150.5 ±49.1	59.5	138.5–162.5	187.1 ±28.0***	73.7	178.1–196.2	-3.6458 (0.0003)	0.8571
	Inside	57.7 ±22.5	22.8	52.3–63.2	35.6 ±15.6***	14.0	30.4–40.5	5.3852 (0.0001)	1.0897
	Outside	44.7 ±8.5	17.7	37.7–50.4	31.1 ±8.9	12.3	28.2–34.0	1.8671 (0.0619)	1.5729
According to the distance	**Short pass (over the distance of one pass)**	227.4 ±38.4	89.9	218.0–236.7	233.7 ±34.1	92.1	222.6–244.7	-0.8477 (0.3985)	0.1707
	Long	20.8 ±14.9	8.2	17.1–24.4	17.5 ±10.4	6.9	14.5–21.3	1.0530 (0.2948)	0.2453
	Skip pass	4.7 ±5.9	1.9	3.2–6.1	2.6 ±3.5	1.0	1.4–3.7	1.6935 (0.0904)	0.4067
Catches	**One-handed**	34.4 ±3.1	13.6	28.8–40.1	35.9 ±4.2	14.1	28.7–43.2	-0.3238 (0.7467)	0.4240
	Two-handed	218.5 ±10.3	86.4	208.2–227.2	217.9 ±9.8	85.9	204.3–231.6	1.0221 (0.3471)	0.0593

Note: Statistically significant difference between the teams placed 1–8 and the other teams: **** p<0.01, *** p<0.001**.

TABLE 3 Diversification of the movement structure on the court with the ball during FIBA EuroBasket 2015

Type of dribbling		Eight highest-ranking teams (n=70)			Eliminated teams (n=40)			Test value (p-value)	Effect size Hedges'g
		$\bar{X}$ ± SD	% of the total	95% confidence interval	$\bar{X}$ ± SD	% of the total	95% confidence interval		
Total dribbles		764.4 ±94.3	100	741.4–787.4	765.7 ±63.2	100	745.2–786.2	-0.2719 (0.7857)	0.0154
According to the sequence of the number of dribbles	**1 dribble**	27.4 ±10.1	3.6	24.9–29.8	33.6 ±8.4**	4.4	30.9–36.4	-3.2736 (0.0014)	0.6512
	2 dribbles	55.6 ±15.7	7.3	51.8–59.5	59.8 ±13.7	7.8	55.3–64.2	-1.3650 (0.1752)	0.2798
	3 dribbles	60.6 ±18.4	7.9	56.1–65.1	54.5 ±14.7	7.1	49.7–59.3	1.8507 (0.0642)	0.3556
	4 dribbles	56.3 ±18.3	7.4	51.9–60.8	65.4 ±19.6*	8.5	59.1–71.8	-2.4069 (0.0179)	0.4846
	5 or more dribbles	564.5 ±117.7	73.8	535.8–593.2	552.4 ±82.2	72.2	525.7–579.0	0.3767 (0.7064)	0.1139
According to the handwork	**Right hand**	366.7 ±55.3	48.0	353.2–380.2	383.7 ±63.4	50.1	363.1–404.3	-1.4447 (0.1515)	0.2913
	Left hand	240.7 ±77.1	31.5	221.9–259.5	228.2 ±66.0	29.8	206.8–249.6	0.8490 (0.3978)	0.1706
	With the change of hands	157.0 ±36.8	20.5	148.0–166.0	153.8 ±40.1	20.1	140.9–166.8	0.4156 (0.6786)	0.0842
According to the manner of changing the direction of dribbling	**Cross-over dribble**	113.7 ±24.2	72.4	107.8–119.6	119.2 ±29.5	77.5	109.9–129.1	-1.0935 (0.2767)	0.2096
	Under the leg	27.6 ±12.3	17.6	24.6–30.6	22.1 ±10.5*	14.4	19.3–26.1	2.0895 (0.0391)	0.4708
	Behind the back	6.4 ±5.1	4.1	5.5–7.9	5.3 ±3.9	3.4	4.0–6.5	1.5379 (0.1271)	0.2339
	Reverse dribble	9.3 ±6.1	5.9	7.9–10.9	7.2 ±4.4	4.7	5.8–8.6	1.9708 (0.0514)	0.3786

Note: Statistically significant difference between the teams placed 1–8 and the other teams: * **p<0.05,** ** **p<0.01**.

TABLE 4 Diversification of the number of actions ending in a turnover performed by the studied teams during FIBA EuroBasket 2015

Type of turnover	Eight highest-ranking teams (n=70)			Eliminated teams (n=40)			Test value (p-value)	Effect size Hedges'g
	$\bar{X}$ ± SD	% of the total	95% confidence interval	$\bar{X}$ ± SD	% of the total	95% confidence interval		
Total turnovers	12.7 ±3.6	100	11.8–13.6	14.5 ±3.4*	100	13.4–15.5	-2.4271 (0.0169)	0.5100
Loss of the ball	3.3 ±1.7	26.0	2.9–3.7	3.8 ±1.8	26.2	3.2–4.4	-1.4096 (0.1616)	0.2879
Travelling	0.8 ±1.1	6.3	0.6–1.1	0.8 ±0.8	5.6	0.5–1.1	0.1999 (0.8419)	0.0000
Bad pass	5.1 ±2.3	40.2	4.6–5.7	6.3 ±2.3*	43.4	5.5–7.0	-2.4143 (0.0175)	0.5217
Offensive foul	1.2 ±1.0	9.4	1.0–1.5	1.5 ±1.4	10.3	1.0–1.9	-0.5241 (0.6002)	0.2585
Received block	1.6 ±1.5	12.6	1.2–2.0	1.5 ±1.3	10.3	1.1–1.9	0.3833 (0.7045)	0.0699
Time violation by the player	0.2 ±0.4	1.6	0.1–0.2	0.1 ±0.3	0.7	0.1–0.2	0.7617 (0.4479)	0.2724
Time violation by the team	0.5 ±0.7	3.9	0.3–0.6	0.5 ±0.6	3.5	0.3–0.7	-0.5636 (0.5743)	0.0000

Note: Statistically significant difference between the teams placed 1–8 and the other teams: *** p<0.05**.

TABLE 5 Summary of the multiple forward stepwise regression for assists executed by players from the best and the weakest teams during FIBA EuroBasket 2015

Type of pass	β	B	p	Adjusted R^2	F	p
	Eight highest-ranking teams (n=70)					
Absolute term		8.8601	**0.0133**	0.6411	28.74	**0.0028**
One-handed with the right hand	0.4763	0.0693	**0.0007**			
Two-handed overhead	0.3047	0.1101	**0.0262**			
	Eliminated teams (n=40)					
Absolute term		1.2097	0.7099	0.7508	21.34	**0.0001**
Two-handed overhead	0.4860	0.1356	**0.0005**			
Long	0.4270	0.1667	**0.0020**			
Two-handed chest	0.3128	0.0445	**0.0205**			